PROTECTIVE IRRIGATION WORKS,

RAJPUTANA.

PONLA PROJECT,

JHALAWAR STATE.

1905.

AJMER:
SCOTTISH MISSION INDUSTRIES CO., LTD.

1905.

INDEX.

PONLA PROJECT IN THE JHALAWAR STATE.

Reference.—Para. 33 of Inspection Note on Irrigation Works and Projects, Jhalawar State, by the Superintending Engineeer, Protective Irrigation Works.

REPORT.

Project described

Two miles south-west of Harnauda is the village of Ponla, and there is a good site for constructing a Tank here on one of the tributaries of the River Au, south-west of the village, the Dam connecting the hills on left bank to the high ground on the right.

No good land will be submerged, and all the land irrigated by wells, about 30 bighas, will be below the Dam, where there is also a large area of good land available for irrigation.

This Project was roughly surveyed by the State Engineer in 1892-1893, but nothing further seems to have been done.

Catchment Area and Water available.

2. The catchment area is 2½ square miles, and as this is all hilly we may safely assume that 20 per cent. of the average rainfall of 30 inches will be available for storage, or 35 m.c.ft. of water.

Areas and Capacity.

3. The following table gives the water-spread and capacity of the proposed Tank at different contours; R.L. 100·00 is taken as bed level of nullah :—

R. L.	Area in s.ft.	Capacity in m.c.ft.	Capacity below each Contour in m.c.ft.
130·00	4,050,000		39·15
		3·93	
W.L. 129·00	3,814,000		35·22
		13·27	
125·00	2,870,000		21·95
		11·55	
120·00	1,800,000		10·40
		6·87	
115·00	990,000		3·53
		2·80	
110·00	220,000		·73
		·73	
100·00	(Bed of nullah)		

If we make Weir-level R. L. 129·00 we shall have a capacity of 35·22 m.c.ft., which is practically the amount estimated as available for storage.

Maxim Discha and L of W

4. The maximum discharge from the $2\frac{1}{2}$ square miles of catchment area is 1,642 cusecs (Dicken's Formula), and a Weir 170 ft. in length will discharge this with a 2-ft. head.

The Weir will be fixed at the south-east end of the Dam, and will be of masonry $2\frac{1}{2}$ ft. thick at top, a front batter of 1 in 12, and a rear batter of 1 in 4.

As there is no rock, foundations will be taken down a depth not less than the depth of water against the front slope of the Weir. Where the Weir meets the Dam a masonry Wing-wall is provided.

Dam.

5. The Dam is 955 r.ft. in length, with crest R. L. 134 or 5 ft. above Weir-level and 3 ft. above flood.

As the ground on the left bank is rocky and on the right bank earth mixed with boulders, a masonry Core-wall has been provided for the whole length of the Dam, with earth in front and rear.

The Core-wall is $1\frac{1}{2}$ ft. thick at top (R. L. 134), and increases 6 inches in thickness at every 5-ft. depth by 3-inch offsets on either side. The foundations in the nullah and on its left are of masonry taken down to and countersunk into the rock; and for the remaining portion concrete is used to within 2 ft. of the surface, the depth of the foundations being equal to half the depth of water against the face of the Dam.

The earth in front starts at flood-level (R. L. 131·00) with a 5-ft. terrace, and then a slope of 3 to 1; and from chainage 600--1,070 this terrace and front slope are protected by a 9-inch layer of boulders on 3 inches of chips and smaller stones.

The earth in rear starts at R. L. 132·50, is 8 ft. wide, and has a 2 to 1 slope.

The Core-wall thus makes a $1\frac{1}{2}$ ft. parapet to the 8-ft. way across the Dam.

Sluice.

6. A Sluice is provided at chainage 700, on the right bank of the nullah, with sill-level R. L. 110·00, giving 34·49 m.c.ft. of water for irrigation, sufficent for 345 acres.

The Sluice should be able to give a first watering of 6 inches in 3 days of 12 hours' flow to the whole of the 345 acres commanded, or—

$$D=\frac{345\times 43{,}560\times\frac{1}{2}}{30\times 12\times 60\times 60}=\frac{7{,}514{,}100}{1{,}296{,}000}=5\cdot 8 \text{ cusecs;}$$ or in the first month it will be required to discharge 7·5 m.c.ft. of water.

In the next three months of Rabi Irrigation season it will have to discharge, with continuous flow, the balance required to water the 345 acres, or—

$$D=\frac{(34\cdot 5-7\cdot 5)}{3\times 2\cdot 592}=\frac{27}{7\cdot 776}=3\cdot 47 \text{ cusecs.}$$ (M. C. Ft.) With the mean head of $9\frac{1}{2}$ ft. a 9-inch diameter Sluice discharges 8·4 cusecs, and with 1-ft. head 2·72 cusecs; but with 2-ft. head will discharge 3·85 cusecs, so has been provided.

Design for Sluice.

7. The Sluice consists of a circular Sluice well in front of the Core-wall, with an opening 2 ft. wide up the face, across which stone slabs with 6-inch openings at every 2 ft. in height are fixed, through which the water enters the chamber.

For 10 ft. in front of this the Wing-walls are built parallel to each other, and 3 ft. apart, forming an outer chamber. Cut-stone grooves $2\frac{1}{2}$ ft. apart are provided into which planks can be placed, and earth rammed between, to shut off the water at any time, so that the Sluice can be examined and repaired if necessary.

An iron grating with vertical bars is also provided to prevent brushwood or anything likely to block the pipe or valves passing into the Sluice well. Beyond this the Wing-walls splay out till the toe of the front slope is reached. The Sluice valve is in the Sluice chamber, and is opened by a vertical rod with screwed head, the screw wheel at the top showing clearly how much the valve is open out at any time. When the Sluice is open the water passes into a masonry arched drain under the rear slopes of the earthen Dam into a distributary chamber, connected with the Irrigation Channels. (See Plan No. III.)

Irrigation Channels

8. Two Irrigation Channels, one on either side of the nullah, have been set out for $1\frac{1}{4}$ miles in length. Both start from the distributary chamber, and each will discharge equally half the maximum discharge required, or 2·9 cusecs.

With 2 ft. fall per mile the size of Channel required for this is 2 ft. bed width, $1\frac{1}{4}$ ft. depth, and side slopes 1 to 1

The Channels will have a slope of 2 ft. per mile, but to keep this gradient eight falls, four on either side, varying in depth from 2 ft. to 5 ft., are required, as the fall of the nullah and the land on either side is so great.

Abstract Estimate of Cost.

9. The following is the Abstract Estimate of the Cost of the Project:—

	Rs.	Rs.
(1) Dam—		
(*a*) Embankment	4,705	
(*b*) Pitching	925	
(*c*) Core-wall	9,696	
		15,326
(2) Weir and Wing-wall		1,290
(3) Sluice		3,319
(4) Irrigation Channels		705
		20,640
(5) Contingencies		1,032
GRAND TOTAL ...		21,672

Value of Water stored.

10. The value of water stored is 1,625 c.ft. per rupee.

Revenue.

11. If there are sufficient cultivators to take up all the 345 acres for which there is water, at Rs. 4 per acre, an annual revenue of Rs 1,380 would be realized, giving a profit of over $6\frac{1}{4}$ per cent. on the estimated cost.

Materials. 12. All materials, *viz.*, stone for building, lime stone, and fuel are obtainable within one mile of Ponla village.

Preparation of Project. 13. The Surveys, Plans and Estimate have been prepared by Overseer Ram Chander under the directions of the Superintending Engineer, Protective Irrigation Works.

SPECIFICATION.

Dimensions 14. All the dimensions and measurements of the work are given in the Plans and Estimates, and are to be strictly adhered to.

Marking-out. 15. The centre line and slopes of Dam to be marked out with trenches 1 ft. deep and 1 ft. broad, showing permanently the inner and outer slopes and the breadth of the top of embankment.

Earthwork. 16. Before any new earth is commenced the old surface to be carefully picked up for at least 9 inches and all roots and grass removed. The new earth to be then thrown down in 9-inch layers, and each layer carefully consolidated before the next is commenced. No clods to be allowed. All layers to be laid concave, that is lower in the centre. No earth is to be excavated within 100 ft. of either toe of the slope.

Masonry. 7. The masonry of the Core-wall, outlet Sluices, Weir, etc., to be of rubble stone set in lime mortar; only hard and durable stones to be used, and the masonry to be kept wet during construction. All the stones to be hammer-dressed and to break joint in the same as well as in the successive courses.

All stones are to be laid on their natural beds; where there is batter the beds of the stones are to be at right angles to the batter. Hollows between the larger stones to be filled in with smaller ones completely embedded in mortar. No empty hollow to be left, nor spaces filled wholly with mortar or rubbish where pieces of stones ought to have been inserted.

The faces of the masonry in contact with the earth to be left quite rough, and those remaining exposed to be smoothed and pointed with lime mortar.

Lime Mortar. 18. The lime to be good stone lime burnt in kilns. The mortar to consist of 1 part of lime to 1½ parts surkee.

F. ST.-G. MANNERS SMITH,
SUPERINTENDING ENGINEER,
Protective Irrigation Works, Rajputana.

AJMER,
26th October 1905.

ABSTRACT ESTIMATE OF COST.

Ponla Project, Jhalawar State.

Quantity or No.	Items.	Rate. Rs. A.	Per	Amount. Rs.	Total. Rs.	Rs.
	1. DAM.					
	(*a*) Embankment—					
941,002 c.ft.	Earthwork	5 0	1000 c.ft.	4,705		
30,823 ,,	(*b*) Pitching	3 0	100 ,,	925		
					5,630	
	(*c*) Core-Wall—					
3,305 c.ft.	Excavation (rock cutting) ...	4 0	100 c.ft.	132		
22,203 ,,	Do. (in hard soil) ..	6 0	1000 ,,	133		
11,240 ,,	Concrete	9 0	100 ,,	1,012		
52,620 ,,	Masonry	16 0	100 ,,	8,419		
					9,896	
						15,326
	2. WEIR AND WING-WALL					
6,068 c.ft.	(*a*) Excavation (in hard soil) ...	6 0	1000 c.ft.	36		
7,838 ,,	(*b*) Masonry	16 0	100 ,,	1,254		
					1,290	
						1,290
	3. SLUICE.					
11,186 c.ft.	(*a*) Excavation	6 0	1000 c.ft.	67		
5,803 ,,	(*b*) Concrete	9 0	100 ,,	522		
12,425 ,,	(*c*) Masonry	16 0	100 ,,	1,988		
379 ,,	(*d*) Archwork	20 0	100 ,,	76		
61 s.ft.	(*e*) Stonework	1 0	s.ft.	61		
88 ,,	(*f*) Iron Grating	1 0	,,	88		
242 r.ft.	(*g*) Iron Ladders	0 4	r.ft.	61		
52 c.ft.	(*h*) Woodwork	3 0	c.ft.	156		
1 No.	(*i*) Sluice Valve, 9″ diameter ...	300 0	each	300		
					3,319	
						3,319
	4. IRRIGATION CHANNELS					
50,750 c.ft.	(*a*) Excavation (in hard soil) ...	6 0	1000 c.ft.	305		
8 Nos.	(*b*) Falls	50 0	each	400		
					705	
						705
	Total ...	...	...	...	...	20,640
	Contingencies	5 0	per cent.	...	...	1,032
	Grand Total ...	...	...	...	...	21,672